GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3172013
Semester – VII
Subject Name: Quality Assurance and Reliability

Type of course: Engineering Science (Professional Elective – III)

Prerequisite: Zeal to learn the subject

Rationale: Concept of quality in engineering products is explored in this subject. Various aspects of quality such as quality management, statistical quality control, system reliability, etc. will be taught to students.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
2	1	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	QUALITY: Definition, History, Importance , Cost of Quality, Approaches of Quality Management, Hierarchy of Quality management: Inspection & Test, Quality Control, Quality Assurance, Total Quality Management, Models of TQM, Elements of TQM, Principles of TQM.	5
2	Statistical Quality Control SQC tools, Benefits of SQC, Concept of variation, Assignable & Chance causes, Attributes & variables, Frequency distribution curve & its types. Normal Distribution curve, Problems on FD curve & ND curve. Control chart for variable: Definition, Formulae & its problems. Control chart patterns, Process capability. Problems on x & R chart and Process capability. Control chart for attribute: Definition, Formulae & its problems. Problems on p, c charts. Need of Sampling	5
3	Quality Improvement techniques: Histogram, Charts, Brain-storming, Cause & Effect diagram, Pareto analysis. Introduction to Six Sigma and Taguchi concepts	4
4	QUALITY MANAGEMENT SYSTEMS: Quality Assurance (QA): Introduction, Definition, Management principles in QA, Forms of QA, QA in different stages. Quality planning, QA program, QA aspect, Quality in material management, Vendor selection & development. ISO: Introduction, ISO 9000 series of standard, ISO 9001 clauses, Benefits of ISO. Deming's approach, PDCA cycle, Juran's approach, JIT, Training for Quality management.	5
5	RELIABILITY CONCEPTS Elements of probability, Reliability engineering fundamentals, Failure data analysis and examples, Failure rate, Failure density, Probability of failure, Mortality rate, Mean time to failure, Hazard Models, Conditional Probabilities and examples, Multiplication rule and examples, Bayes theorem and examples	6

6	SYSTEM RELIABILITY and IMPROVEMENT Reliability of series and parallel connected systems and examples, applications of r-out of –n structures, Improvement of components, Element Redundancy, Unit redundancy, Standby redundancy	3

Suggested Specification table with Marks out of 100 (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**25**	**25**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. L.S.Srinath, Reliability Engineering, Affiliated East West Press
2. Seymour Lipschutz Schaums, outline of theory & problems of Probability SI (Metric) Edition 1981. Tata McGraw-Hill Publishing Co. Ltd.
3. M. Mahajan, Statistical Quality Control, Dhanpat Rai & Co. (P) Ltd.
4. Hopper A. G., Basic Statistical Quality Control, Tata McGraw-Hill Publishing Co. Ltd.
5. K.C.Arora, Total Quality Management, S.K.Kataria & Sons
6. Dale Besterfield, Carol Besterfield, Glen H. Besterfield, Mary Besterfield, Total Quality Management, Pearson Education Inc., First Indian Reprint 2001.
7. Mohamad Zairi, Total Quality Management for Engineers, Gulf Publishing Company 1991.
8. Phillip J. Ross, Taguchi Techniques for Quality Engineering, McGraw Hill Book Co.
9. David Hoyle, ISO9000 Quality Systems Handbook, Butterworth-Heinemann Publications

Course Outcomes:

After successful completion of the course the students shall be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the significance of Quality and hierarchy of Quality Management: Inspection & Test, Quality Control, Quality Assurance and Total Quality Management	25%
CO-2	Get acquainted with the concepts of Quality Assurance in detail, including Quality Management Systems such as ISO 9000 series of quality standard and its objectives	15%

CO-3	Learn to use several Quality Improvement Tools like Histogram, charts, Brain Storming exercise, Cause & Effect Diagram & Pareto Diagram. In addition they would get an introduction about taguchi and six sigma.	25%
CO-4	Know about elements of probability and concept of reliability engineering including failure data analysis.	35%

List of probable Tutorials:

1. Case study on cost of quality
2. Case study on TQM
3. Problems on x & R chart and Process capability
4. Problems on p & c charts
5. Case study on quality improvement tools
6. Cause and Effect diagrams
7. Pareto Analysis
8. Failure data analysis
9. Hazard models
10. Examples of bayes theorem
11. Analysis of redundancies
12. Reliability for series and parallel systems

List of Experiments:

NA

Major Equipment:

NA

List of Open Source Software/learning website:

www.nptel.ac.in